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## Wisconsin Karner Blue Butterfly Habitat Conservation Plan and Environmental Impact Statement

### **Chapter 2: Statewide Karner Blue Butterfly Habitat Conservation Plan (HCP)**

#### **A. Geography of Wisconsin**

This section provides a general, statewide overview of the features of Wisconsin. It covers the physical and biotic aspects, as well as human demographic and social trends. Similar information specific to the documented Karner blue butterfly range is provided in Chapter IV of the EIS (pages 245-273).

##### **1. Physical Geography**

Wisconsin is one of the larger states east of the Mississippi River, with a total area of more than 56,150 square miles (more than 35 million acres). The north and south dimensions of the state are a little more than 300 miles, and the state is nearly as wide at its widest place. The narrowest east to west width is along the Wisconsin-Illinois border and is a little less than 145 miles.

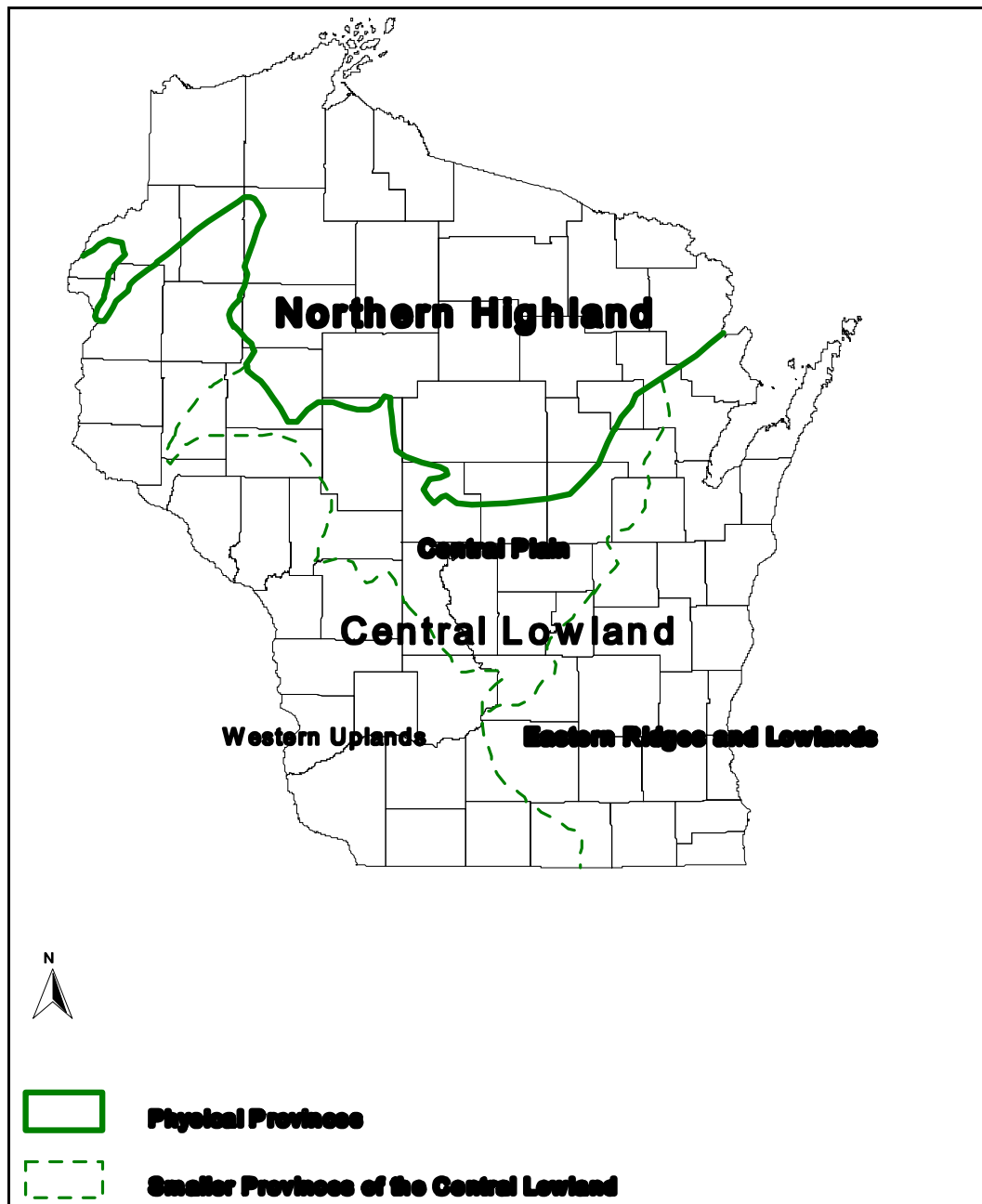
Nearly 85 percent of the land in Wisconsin is privately owned and managed. Public lands in the state comprise a little over 15 percent of the state's total acreage (DNR 1993). Public lands include national forest, park and wildlife refuges; state forest, park, fishery, wildlife and natural areas; and county and local forest, park and conservation areas. Information in this chapter pertains to the state as a whole.

**Geology and Soils.** The geology of Wisconsin includes parts of two major physical provinces of different geologic character: the Northern Highland, which is part of the Superior Upland -- the southern most part of the Canadian shield; and the Central Lowland which is part of the stable continental interior (Paull and Paull 1977).

The Canadian shield, projecting into the northern part of the state as the Northern Highland Province, is mainly composed of metamorphic and igneous rocks of Precambrian age (greater than 600 million years old). These rocks were intensely folded, faulted and subjected to igneous activity during a long and complex history (Paull and Paull 1977).

Within the bedrock of the Northern Highlands Province there are complex assemblages of igneous and metamorphic rocks that contain metal-bearing minerals, primarily zinc and copper. In localized areas, these minerals occur in concentrations of sufficient tonnage (size) and grade (richness of the metal content) that they have generated interest in evaluation as potential mining projects. However, this level of mineral presence for possible mining development is extremely rare.

**Figure 2.1. Physical Provinces of Wisconsin (Adapted from Paull and Paull 1977)**



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In contrast to the Northern Highlands, the bedrock of the stable continental interior, known as the Central Lowlands Province, consists of nearly flat-lying or gently folded sedimentary strata of Paleozoic or younger age. In Wisconsin, the Central Lowlands Province can be further divided into three smaller provinces; these are the Central Plain, the Western Uplands and the Eastern Ridges and Lowlands (Figure 2.1, page 16).

Twice during the Pleistocene Epoch, Wisconsin was covered with great ice sheets. Both the Central Lowlands and the Northern Highlands were affected by continental glaciation during this epoch. The first and older period, the Illinoian Glacial Stage, extended farther south than the second, the Wisconsin. Although the Wisconsin Stage was less extensive, it was probably more prolonged. Neither of these glaciations covered an extensive area in the central and southwestern parts of the state, now known as the Driftless Area.

Soil fertility in much of the state is derived from the glacially ground rock and mineral debris deposited in the Pleistocene period. Glacial deposits, including clay, sand and gravel, cover bedrock in the northern and eastern three-fifths of the state (Wis. Geol. Nat. Hist. Surv. 1981). In the Driftless Area, residual soils developed directly on bedrock (Paull and Paull 1977). The quality of drainage, degree of slope and local differences in climate and native vegetation have influenced soil development. These factors, combined with bedrock and glacial variations, have resulted in more than 350 distinctly different soils in Wisconsin (Paull and Paull 1977).

For additional information on bedrock geology readers are referred to the *Bedrock Geology of Wisconsin* map prepared by the Wisconsin Geologic and Natural History Survey (Wis. Geol. Nat. Hist. Surv. 1981). For a more thorough discussion of the geology of Wisconsin, readers are referred to *Geology of Wisconsin and Upper Michigan Including Parts of Adjacent States* (Paull and Paull 1977) and *The Physical Geography of Wisconsin* (Martin 1965). For additional information on soils, readers should consult individual county soil surveys prepared by the U.S. Soil Conservation Service (now called the Natural Resources Conservation Service).

**Hydrology and Drainage.** Altitudes in the state range from 579 feet above mean sea level at the low water surface of Lake Michigan at Milwaukee to 1,951.5 feet above mean sea level at Tim's Hill in Price County. In southwestern Wisconsin, the surface of low water of the Mississippi River opposite Dubuque, Iowa is about 595 feet above sea level.

Surface water in Wisconsin drains into the Mississippi River, Lake Superior, or Lake Michigan. The state is divided into 32 river drainage basins that feed into the three major basins. Most of Wisconsin's land area drains into the Mississippi River (Figure 2.2, page 19).

Wisconsin has more than 32,000 miles of perennial river and stream, 14,973 inland lakes, 1,751 square miles of Great Lakes estuaries and bays along 1,017 miles of Great Lakes shoreline and

5.3 million acres of wetland (Turville-Heitz 1994). Lakes in the state cover more than a million acres; most are located in the northern part of the state and are naturally occurring and of glacial origin.

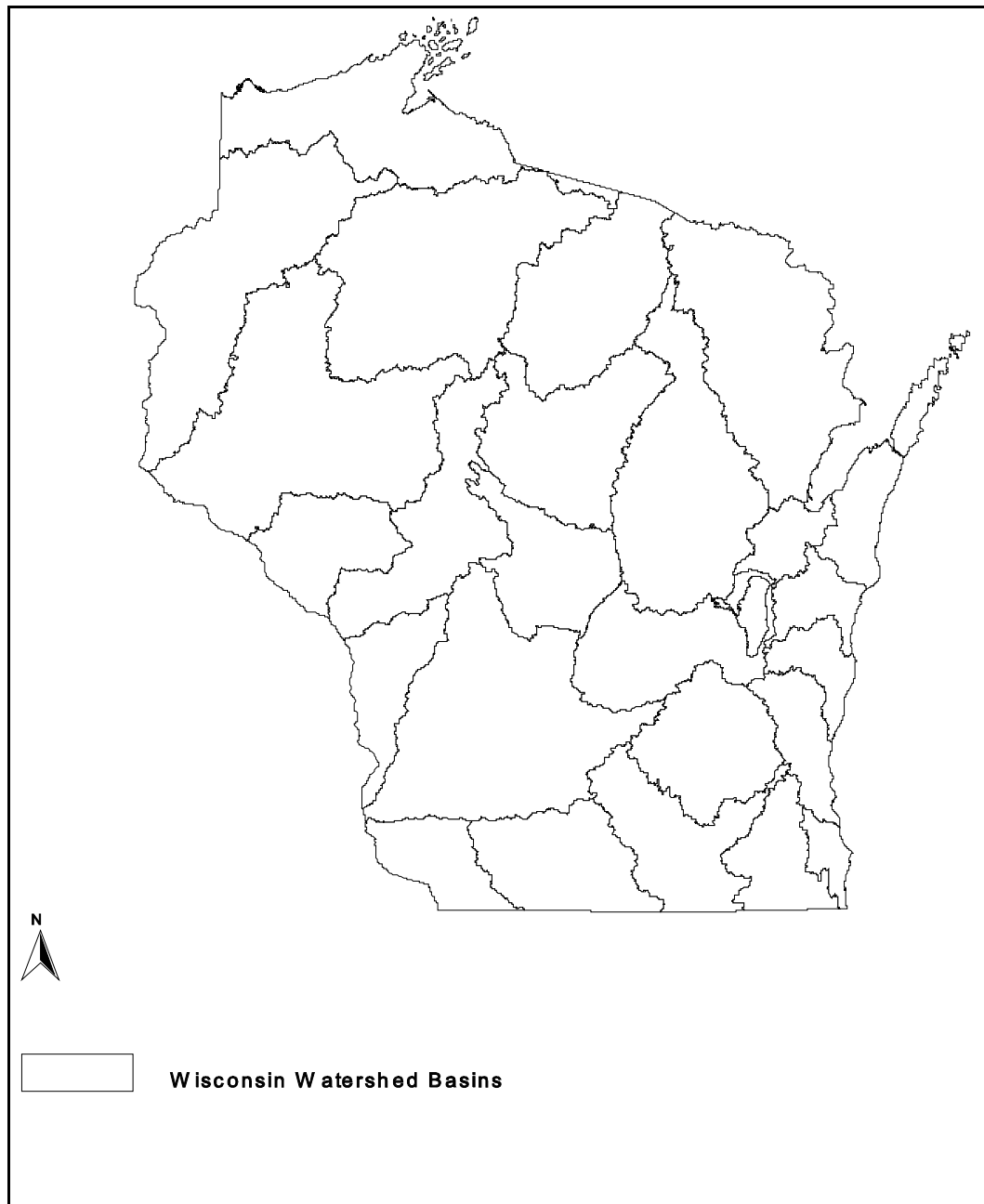
Wetlands are interrelated and interspersed among all other natural communities found in the state. In the Driftless Area, forested and non-forested wetlands exist primarily along streams and rivers or as spring seeps. In other regions of the state, wetlands occur on areas of peat soils occupying former glacial lake beds, as potholes and fens; along streams and rivers; on the borders of lakes; as bogs, forested swamps and bottomlands; and as estuaries and coastal wetlands along Lakes Michigan and Superior (Miller 1995). Most of the 5.3 million acres of wetlands are located in the northern third of the state.

For additional information on the past and present status, regulation of and projected future of Wisconsin wetlands, readers are referred to Miller (1995). Information on the quality of all Wisconsin's water resources is included in the *1994 Wisconsin Water Quality Assessment Report to Congress* (Turville-Heitz 1994).

**Climate and Weather.** The climate of the state is somewhat variable; it is subject to the sudden changes that occur in many parts of the Upper Midwest. Rainfall is about 30 inches annually. The length of the growing season ranges from 170 days in extreme southeastern Wisconsin to about 100 days in Vilas and Iron counties. Lake Superior creates a modifying effect, extending the growing season in some adjacent areas to about 150 days.

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**Figure 2.2. Wisconsin's Major River Drainage Basins**



## 2. Biogeography

This section briefly describes the biological resources present in Wisconsin. Information in this section pertains to the state as a whole. For biogeographic information specific to the Karner blue butterfly's range, readers are referred to the discussion of the "Affected Environment" in Chapter IV.

The state of Wisconsin has been broken down into ecological units depicting particular physical and biological components through the *National Hierarchical Framework of Ecological Units*. Under this classification system, the state is comprised of six broad types of communities or sections (Figure 2.3, page 21). Wisconsin's forest industry, county forests, the Wisconsin Woodland Owners Association, the Nature Conservancy, the DNR and the U.S. Forest Service signed a memorandum of understanding in 1994 making the National Hierarchical Framework of Ecological units the basis for forest classification.

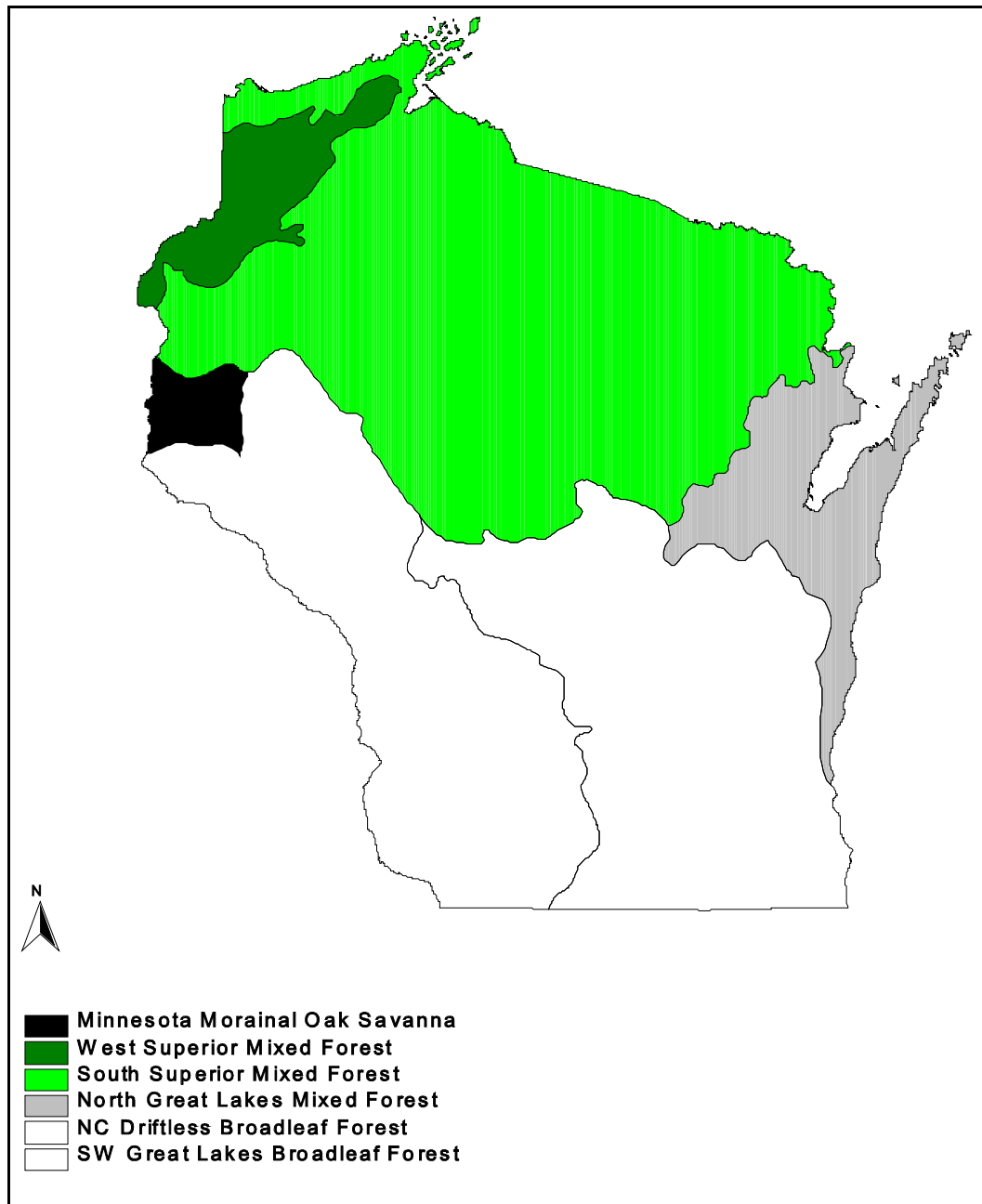
**Plant Communities.** The location and extent of plant and associated animal communities are determined by environmental gradients of moisture, temperature, soil type and climate. They are also shaped by historical events, migration and natural and human-induced disturbance. In the report *Wisconsin's Biodiversity as a Management Issue*, the Curtis (1959) system for classifying vegetation was chosen as a framework for evaluation because of its specificity to Wisconsin. This system, which nests within the National Hierarchical Framework (Figure 2.3, page 21), identifies seven major biological communities in the state: northern forests, southern forests, oak and pine barrens, oak savannas, grasslands, wetlands and aquatic systems.

The most pronounced environmental gradient in Wisconsin is located in a narrow band that runs from northwestern to southeastern Wisconsin, called the *tension zone* by Curtis (1959) (see Figure 2.4, page 22). Many plant and animal species reach the limit of their ranges in this area. In Wisconsin, the tension zone delineates the northern forest, including the boreal element, from the southern forest and prairies. Although climate is a major reason for the tension zone, soil type and other factors also play a role (Curtis 1959, Les 1995).

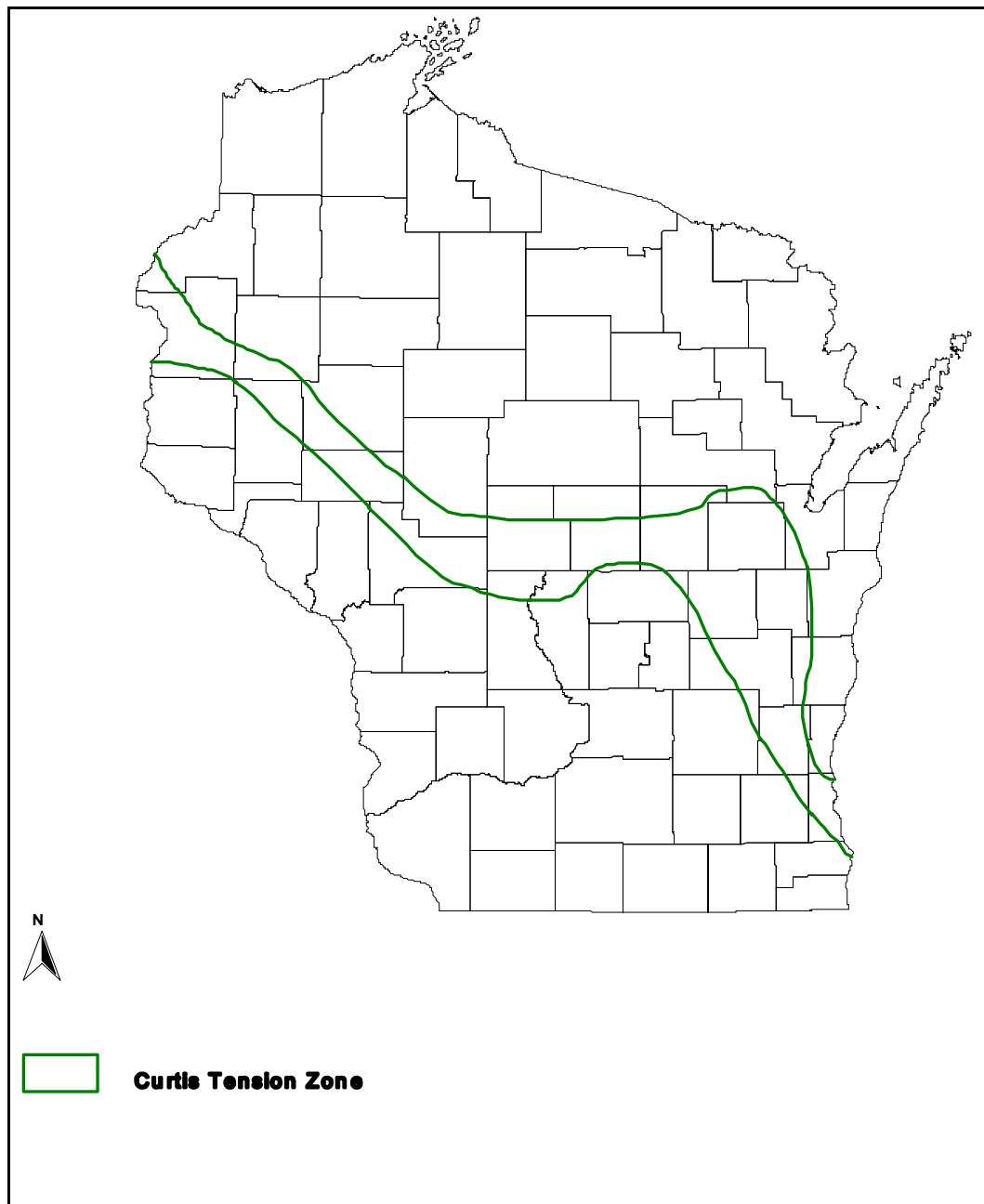
About 2,000 species of native herbaceous plants are found in Wisconsin, including grasses, sedges and other flowering plants (June Dobberpuhl, Heritage Inventory Botanist, Wisconsin DNR, pers. comm.). Federally-listed plant species occurring in Wisconsin include: northern monkshood (*Aconitum noveboracense*), dune (Pitcher's) thistle (*Cirsium pitcheri*), Fassett's locoweed (*Oxypolis campestris* var. *chartacea*), dwarf lake iris (*Iris lacustris*), eastern prairie fringed orchid (*Platanthera leucophaea*) and prairie bush clover (*Lespedeza leptostachya*). At the state level 56 plants are listed as endangered, 55 are listed as threatened and 172 are listed as special concern. State special concern species include those which appear to be threatened either because they are uncommon, are restricted to unique or highly specific habitats, or may be vulnerable to loss for various reasons. Further study is necessary to ascertain their status in the state (Martin 1995).

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**Figure 2.3. National Hierarchical Framework of Ecological Units**



**Figure 2.4. Location of the Tension Zone (Adapted from Curtis 1959)**





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The first systematic record of forest communities in Wisconsin was created in the mid-1800s, when a land survey of the state was completed by the U.S. Geological Survey (Les 1995). Vegetation maps based on these records (e.g., Finley 1976) show a diversity of natural communities, including extensive forests and wetlands, as well as the fire-dependent grassland, barrens and savanna communities. Presettlement forests in the lake states were extremely diverse. The northern mesic forest of sugar maple (*Acer saccharum*), yellow birch (*Betula lutea*) and hemlock (*Tsuga canadensis*) was interspersed with extensive stands of white and red pine (*Pinus strobus* and *P. resinosa*) and several sandy, droughty areas of barrens, often containing scattered jack pine (*Pinus banksiana*) and Hill's oak (*Quercus ellipsoidalis*). In the northwestern podzolized sands, red and white pine forests infused with jack pine barrens were common. In the uplands of the central plains, fire-dominated communities including the pine and oak barrens were very common. In the Lake Michigan shorelands, the native forests included sugar maple, basswood (*Tilia americana*), yellow birch, beech (*Fagus grandifolia*), elm (*Ulmus americana*) and hemlock. In the southeast portion of the state, the native vegetation included deciduous forest, oak savanna and prairies. The driftless area of the southwest included the native vegetation of oak savanna, deciduous forest, pure stands of prairie, pine and oak barrens along sandy river terraces, and extensive river bottom forest.

Today, Wisconsin has forest acreage roughly equal to that in place at the time of Euro-American settlement, but it is very different in age structure and species composition. Major logging and agriculture clearing efforts in the early 1900s, followed by uncontrolled wildfires, greatly disturbed the Wisconsin landscape. Young, pioneer forests reclaimed many of the sites, while at the same time major reforestation efforts began. Forests today reflect the history of the early 1900s. Approximately 16 million acres of forest currently exist in the state. Of that, forest plantations comprise about 711,000 acres. Over two-thirds of the forestlands in the state are less than 60 years old. Early successional species, like aspen (*Populus* sp.), paper birch (*Betula papyrifera*) and jack pine (*Pinus banksiana*), represent roughly one-fourth of the forested landscape. Barrens, savannas and grasslands exist, but only in scattered locations (Les 1995), and most of what remains of prairies, savannas and certain wetland types is the result of the managed use of fire.

For additional information on the history of forest and other natural area management, readers are referred to Part C of Chapter II. The report *Wisconsin's Biodiversity as a Management Issue* contains detailed descriptions of Wisconsin's major plant communities, including their history, present status and management concerns.

**Wildlife.** Wisconsin has a rich and varied fauna. General information on major wildlife groups is provided below. Readers are referred to appropriate literature for more detailed information on the biology and distribution of Wisconsin's wildlife species. Species associated with the Karner blue butterfly are discussed in more detail in Chapter IV and Appendix B.

Wisconsin's wildlife plays an important part in the state's economy and quality of life. In 1991

alone, 2.1 million state residents participated in observing, feeding, or photographing wildlife, and 408,000 non-residents made trips to Wisconsin to do the same (McCown 1994). Sport fishing is the second most popular use of surface water resources in the state; only swimming attracts more water enthusiasts (Becker 1983). More than 281,000 people bought small game, sportsman, senior citizen small game, non-resident small game, 5-day non-resident small game, or conservation patron licenses for the 1994-1995 hunting season (Dhuey 1995a). Records indicate that the fur trade accounted for more than \$4.5 million dollars during the 1994-1995 trapping season. Fur harvest data as reported by licensed Wisconsin fur buyers indicate 1.09 million pelts were purchased from Wisconsin fur dealers (Dhuey 1995b).

**Mammals.** For detailed information on the biology and distribution of Wisconsin mammals, readers are referred to Jackson (1961), Long (1974), Kurta (1995) and references cited therein. Several mammal species are state or federally-listed as endangered. There are no mammal species in Wisconsin that are state or federally-listed as threatened.

The timber wolf (*Canis lupus*) is the only Wisconsin mammal that is listed as endangered by both the state and the USFWS. The Wisconsin population consists of 178-184 wolves occurring in 47 groups (Wydeven and Boles 1998). Both the state (Wis. Timber Wolf Recovery Team 1989) and the federal wolf recovery plan goals (USFWS 1992c) include establishing a sustainable population of 80 wolves in Wisconsin by the year 2000. In addition, the federal goals include establishing a viable population of 100 wolves outside of Minnesota and Isle Royale. If the populations of wolves remain stable or increase, federal reclassification to threatened or delisting could occur during 1999 or 2000.

The Canada lynx (*Lynx canadensis*) was previously listed as endangered by the state. It was down-listed to "special concern" in 1997, and placed on the list of protected animals (NR 10, *Wis. Adm. Code*). This species only occasionally occurs in Wisconsin in invasion years in the winter and there is no evidence of breeding. It is unclear if the lynx did once breed in the state and is now extirpated, or was always an occasional visitor (Thiel 1987; Charles Pils, Director, Bureau of Endangered Resources, Wisconsin DNR, pers. comm.). The lynx has no special status in Minnesota. The USFWS proposed listing Canada lynx in 1998, based on its range-wide status and potential threats.

The American marten (Pine marten, *Martes americana*) is listed as endangered by the state. Marten were reintroduced into the Nicolet National Forest between 1975 and 1983, and the Chequamegon National Forest between 1987 and 1990. Current marten survey results are presented in Wydeven (1995) and Wydeven and Ashbrenner (1995).

There is one historical record of the federally-endangered Indiana bat (*Myotis sodalis*) from extreme southwestern Wisconsin (Jackson 1961).

**Large Ungulates.** White-tail deer (*Odocoileus virginianus*) populations exceed 1.2 million

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statewide. Numerous studies indicate deer are a favorite type of wildlife in Wisconsin -- among both hunters and non-hunters (McCown 1994). In 1982, the Wisconsin legislature declared the white-tailed deer Wisconsin's state wildlife animal. Deer are a major factor in Wisconsin's recreational economy, with approximately 6 million hunter days annually. Deer hunting licenses alone brought in more than \$23 million in 1991 (McCown 1994). Deer are also very important to the cultural heritage of Native American tribes.

Deer populations are also associated with some significant problems, including agricultural damage, deer-vehicle collisions and habitat degradation. For example, deer-vehicle collisions accounted for 16.6 percent and 16.1 percent of all crashes in 1994 and 1995, respectively, and in three counties deer-vehicle collisions accounted for more than half of all reported crashes (Wis. Dept. Transportation 1996). Harvest management is the primary means used by the DNR to maintain deer populations at or near population goals.

**Birds.** Robbins (1991) contains detailed information on Wisconsin birdlife. Three hundred-ninety-four species of birds have been observed in Wisconsin, and an additional 13 species are considered hypothetical species (Robbins 1991). An additional six species previously observed in the state are believed to have occurred under conditions which suggest escape or release in or near the state's borders. A number of species are resident species (i.e. they are essentially nonmigratory species) such as the Ruffed Grouse (*Bonasa umbellus*) and House Sparrow (*Passer domesticus*). Others are classified as summer residents and are confirmed or presumed breeders in the state (e.g., Whip-poor-will [*Caprimulgus vociferus*], Bell's Vireo [*Vireo bellii*] and Northern Flicker [*Colaptes auratus*]). Some birds are winter residents, presumably tied to a limited territory during their period of winter residency (e.g., Dark-eyed Junco [*Junco hyemalis*]). Still others are migrants which pass through the state in spring and fall (e.g., Tundra Swan [*Cygnus columbinus*] and Swainson's Hawk [*Buteo swainsoni*]).

In Wisconsin, thirteen birds are state-listed as endangered, with another thirteen listed as threatened (Table 2.1, page 26). State recovery plans have been developed for the Trumpeter Swan (*Cygnus buccinator*), Peregrine Falcon (*Falco peregrinus*), Loggerhead Shrike (*Lanius ludovicianus*), Red-necked Grebe (*Podiceps grisegena*), Forster's Tern (*Sterna forsteri*), Common Tern (*S. hirundo*), Great Egret (*Casmerodius albus*), Osprey (*Pandion haliaetus*) and Bald Eagle. Birds federally-listed as endangered are the Piping Plover (*Charadrius melodus*), Kirtland's Warbler (*Dendroica kirtlandii*) and Peregrine Falcon (*Falco peregrinus*). The Bald Eagle (*Haliaeetus leucocephalus*) is federally-listed as threatened. Federally-listed species are discussed in more detail in Chapters IV and V, with an emphasis on those associated with Karner blue butterfly habitat. Federal recovery plans have been developed for all four federally-listed species.

**Table 2.1. Birds Listed as Threatened or Endangered Species by the Wisconsin DNR**

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Threatened Species

Henslow's Sparrow (*Ammodramus henslowii*)  
Red-shouldered Hawk (*Buteo lineatus*)  
Great Egret (*Casmerodius albus*)  
Yellow Rail (*Coturnicops noveboracensis*)  
Spruce Grouse (*Dendragapus canadensis*)  
Cerulean Warbler (*Dendroica cerulea*)  
Acadian Flycatcher (*Empidonax virescens*)  
Yellow-crowned Night Heron (*Nycticorax violaceus*)  
Kentucky Warbler (*Oporornis formosus*)  
Osprey (*Pandion haliaetus*)  
Greater Prairie-Chicken (*Tympanuchus cupido pinnatus*)  
Bell's Vireo (*Vireo bellii*)  
Hooded Warbler (*Wilsonia citrina*)

Endangered Species

Piping Plover (*Charadrius melodus*)  
Trumpeter Swan (*Cygnus buccinator*)  
Yellow-throated Warbler (*Denroica dominica*)  
Snowy Egret (*Egretta thula*)  
Peregrine Falcon (*Falco peregrinus*)  
Worm-eating Warbler (*Helmitheros vermivorus*)  
Loggerhead Shrike (*Lanius ludovicianus*)  
Red-necked Grebe (*Podiceps grisegena*)  
Caspian Tern (*Sterna caspia*)  
Forster's Tern (*Sterna forsteri*)  
Common Tern (*Sterna hirundo*)  
Bewick's Wren (*Thyromanes bewickii*)  
Barn owl (*Tyto alba*)

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**Amphibians and Reptiles.** A diverse group of amphibians and reptiles occurs in Wisconsin, including nineteen amphibians and 35 reptiles. Thirty-nine of these species are habitat generalists and the remaining fifteen are habitat specialists (Hay 1995). There are no federally-listed endangered or threatened amphibians or reptiles in Wisconsin. However, the eastern massasauga rattlesnake (*Sistrurus catenatus catenatus*) is being considered for federal listing. Seven species are listed as endangered and two are listed as threatened by the state (Table 2.2, page 27). In addition, the Wisconsin DNR was petitioned in 1996 to list the timber rattlesnake (*Crotalus*

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*horridus*) as a threatened species. Timber rattlesnakes were added to Wisconsin's protected wild animals list in 1997 (NR 10, *Wis. Adm. Code*). For additional information on the biology and distribution of Wisconsin reptiles and amphibians, readers are referred to Vogt (1981), Casper (1996), Dhuey, *et al.* (1995) and works included in the bibliographies compiled by Dlutkowski, *et al.* (1987) and Watermolen (1992).

**Table 2.2. Amphibians and Reptiles Listed as Threatened and Endangered Species by the Wisconsin DNR**

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Threatened Species

Blanding's turtle (*Emydoidea blandingi*)  
wood turtle (*Clemmys insculpta*)

Endangered Species

Blanchard's cricket frog (*Acris crepitans blanchardi*)  
ornate box turtle (*Terrapene ornata*)  
eastern massasauga rattlesnake (*Sistrurus catenatus catenatus*)  
queen snake (*Regina septemvittata*)  
western ribbon snake (*Thamnophis proximus*)  
northern ribbon snake (*T. sauritus*)  
slender glass lizard (*Ophisaurus attenuatus*)

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**Fishes.** One hundred fifty-seven species of fish occur in Wisconsin lakes, rivers and streams (Becker 1983). Additional information on the biology and distribution of Wisconsin's fishes can be found in Becker (1983) and Fago (1992) and the reference cited therein.

The structure of fish communities/assemblages varies between different types of water. High quality coldwater streams in Wisconsin have few fish species, with trout and sculpins dominating, and lack many of the taxonomic groups that are more common in warmwater streams (Lyons, *et al.* 1996). Species typical of these streams include brook trout (*Salvelinus fontinalis*) and mottled and slimy sculpins (*Cottus bairdii* and *C. cognatus*) (Lyons 1992). Warmwater streams in the state typically have a large number of fish species, with minnows, suckers, sunfishes and perches dominating (Lyons, *et al.* 1988, Lyons 1989). Fish communities in Wisconsin inland lakes are generally typical of warm-water mesotrophic or eutrophic systems (Gebkin, *et al.* 1995). They are dominated by native species, including largemouth bass (*Micropterus salmoides*), black crappie (*Pomoxis nigromaculatus*), northern pike (*Esox lucius*), rock bass (*Ambloplites rupestris*) and smallmouth bass (*Micropterus dolomieu*) (Becker 1983; Fago 1992; Gebkin, *et al.* 1995).

Ten fish species are listed as endangered and eleven are listed as threatened by the state. The endangered species are generally small in size and restricted to medium or large warmwater rivers in southern Wisconsin. The threatened species encompass a much wider range of body sizes and habitat types, and a few are known from throughout the state (Lyons 1996).

**Invertebrates.** There are an estimated 18,000 to 19,000 insect species in Wisconsin, most of which are terrestrial. The current Wisconsin endangered, threatened and special concern species list has 72 terrestrial insect species; eighty-two percent of these are moths and butterflies (Henderson 1995a). Because they are more widely studied and documented, however, that percentage primarily represents butterflies.

At this time, knowledge of most invertebrate taxa found in Wisconsin is very limited. With the exception of a few insect species, knowledge or understanding about what impact various management practices may have on most invertebrates is nearly non-existent. Basic biological and distribution information on major terrestrial invertebrate groups can be found in the following references: earthworms (Hendrix 1995), snails (Jass 1980, 1986; Hubricht 1985), spiders and harvestmen (Levi and Levi 1952; Levi and Field 1954; Levi, *et al.* 1958; Jass 1995), millipedes (Hopkin and Read 1992, Watermolen 1995), centipedes (Auerbach 1951a, 1951b; Summers 1979; Watermolen 1997), isopods (Jass and Klausmeier 1987, 1990a, 1990b, 1996), butterflies (Ebner 1970; Johnson and Malick 1972; Ferge 1990; Swengel 1991, 1995a; Borth 1996), moths (Ferge 1992, Kons and Borth 1996), beetles (Arnett 1968) and grasshoppers (Otte 1981a, 1981b).

In addition, to the terrestrial invertebrates, there are a large number of aquatic invertebrates that are listed as threatened or endangered. These include the federally-listed Higgin's eye pearly mussel (*Lampsyllis higginsi*), the winged mapleleaf mussel (*Quadrula fragosa*) and the Hine's emerald dragonfly (*Somatochlora hineana*). Aquatic species are not discussed in detail here or in the environmental impact statement (EIS) because it is unlikely the proposed activities will have any significant effect on them.

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### 3. Human Population and Demographics

This section discusses statewide population and demographic trends. Material in this section is primarily adapted from the Wisconsin Strategic Growth Task Force's 1995 report *Land Use Issues Facing Wisconsin* and information provided by the Wisconsin Department of Administration. Human population and demographic trends specific to the Karner blue butterfly's range are presented in the discussion of the "Affected Environment" in Chapter IV.

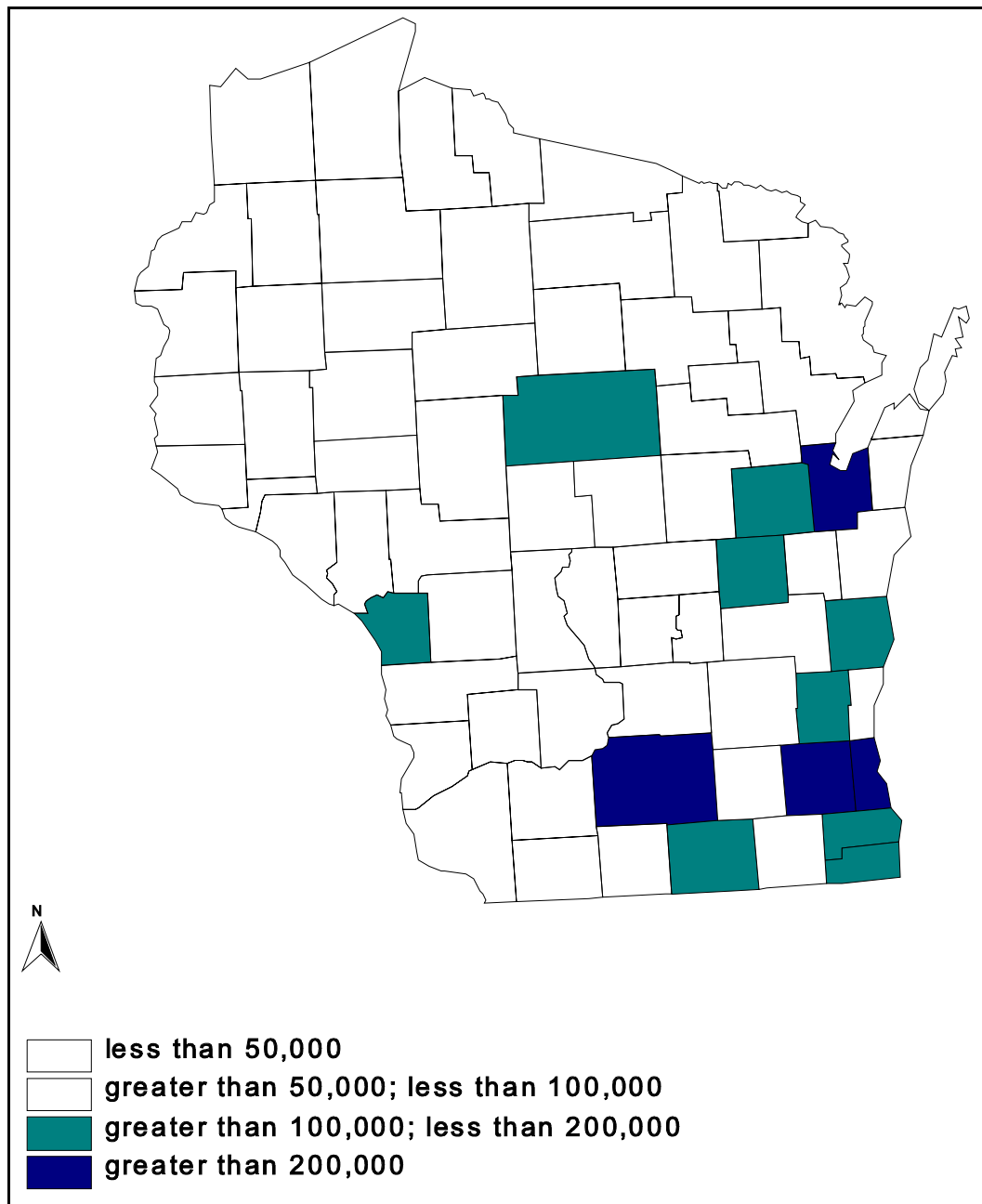
**Statewide Population Trends.** Wisconsin has a total human population of 4.89 million (Figure 2.5, page 30). The state's population has more than doubled since the turn of the century. However, the rate of increase has been decreasing over the last 30 years with a 15.1 percent increase from 1950 to 1960, an 11.8 percent increase from 1960 to 1970, a 6.5 percent increase from 1970 to 1980, and a four percent increase from 1980 to 1990. Forecasters predict the state's population to reach 5.7 million people by the year 2020, a sixteen percent increase from 1990, with over half the growth occurring in just five counties: Brown, Dane, Kenosha, Milwaukee and Waukesha (Kale, *et al.* 1994). The high growth rates experienced by some northern counties in the past 20 years are predicted to slightly recede between 1995 and 2020.

While the overall population increased nearly 24 percent during the past 30 years, the urban population increased over 27 percent. Although the urban population has maintained a relatively constant 65 percent of the total population over this same period, urban growth is no longer concentrated in existing cities. The number of places with a population greater than 2,500 (the lowest census indicator for an urban area) has increased by over 100 percent since 1960. In this context, "places" are defined as incorporated or unincorporated areas with a density of 1,000 people or more per square mile. Shifting census definitions regarding urban and rural areas make it difficult to recognize and define the developing exurbia of today (Nelson 1992). The data presented here are the best available for comparing suburban growth trends over time.

**Population Shifts from Central Urban Areas.** Data provided in Table 2.3 (page 32) provide evidence of the suburban population shift occurring in the state, a trend occurring nationwide. The table lists the absolute and percent change in the population and number of places for different size categories defined by the U.S. Census Bureau. The categories in Table 2.3 show the most rapid population growth are urban fringe places of 10,000 to 50,000 population and urban places of over 10,000 people outside urbanized areas.

Based on Department of Administration estimates, all but 10 counties have shown a net in-migration since 1990. Counties showing the highest estimated percentage increase in population due to net in-migration since 1990 include Adams, Sauk, Washington, Waukesha, Walworth and Waupaca counties in the south and central part of the state, and Vilas, Oneida, Florence, Oconto, Sawyer, Washburn and Burnett counties in the north.

**Figure 2.5. 1996 County Population (Based on U.S. Census Bureau and Wisconsin Dept. of Administration Figures)**





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Population growth in suburban counties has out-paced growth in urban counties. For example, Milwaukee's three suburban counties -- Ozaukee, Washington and Waukesha -- collectively have grown seven times faster than Milwaukee County since 1990 (Wis. Dept. of Admin. 1994). Projections for the next 30 years show the highest percentage growth to continue in only nine of 20 counties that received the greatest increases from 1970 to 1990. Additions to this list include counties that extend the edge of the urban fringe of existing metropolitan areas, such as Sauk and Pierce counties.

**Housing and Household Trends.** Of the net increase in housing units in Wisconsin from 1980 to 1990, about 65 percent occurred in metropolitan counties. About 63 percent occurred in urban counties (i.e. those with population density averaging over 100 persons per square mile). About 18 percent occurred in non-metropolitan, non-recreational counties. About 17 percent occurred in recreational counties (i.e. those in which at least 20 percent of housing units were vacant and held for seasonal, recreational, or occasional use). About seven percent of Wisconsin's homes were used for recreation in 1990, twice the average for the United States as a whole. At the extreme, Vilas County had 57 percent of the homes used for recreation.

The percentage of increase in total housing units from 1980 to 1990 was about twelve to thirteen percent in both non-metropolitan recreational and metropolitan counties, compared to only eight percent in non-metropolitan, non-recreational counties. In Vilas and Oneida counties, the number of building permits issued rose about 76 percent from 1990 to 1994 (Daykin 1995). The percentage of central city housing which was owner-occupied in 1990 was about 50 percent, compared to 70 percent in metropolitan areas outside cities, 77 percent in the rural part of metropolitan areas and 57 percent outside metropolitan areas.

Trends in household size and household growth are factors linked to land use decisions. Over time, average household size in Wisconsin has steadily declined. The average household size in Wisconsin was 3.43 persons per household in 1950; by 1990, it had fallen to 2.61 persons per household (Wis. Dept. of Admin. 1994). By the year 2010, that number is expected to drop below 2.5. Wisconsin is projected to add 430,000 households between 1990 and 2015, increasing 24 percent (Besl 1994). Counties that make up the state's metropolitan regions are expected to capture most of the new households. From a percentage standpoint, many rural northern counties could see their total households increase substantially.

**Table 2.3. Change in Population and Number of Places in Wisconsin by Size of Place Category, 1980-1990 (Derived from 1990 U.S. Census of Population and Housing )**

Type of Place by Population and Location	Absolute Change in Population	Percentage Change in Population	Absolute Change in # Places	Percentage Change in # Places
Urban central places plus urban fringe places of over 50,000	25,386	1.60	0	0.0
Urban fringe places of 10,000 to 50,000	76,581	17.40	2	8.0
Urban fringe places of 2,500 to 10,000	15,561	10.70	1	4.0
Urban fringe places of less than 2,500	16	0.08	-1	-7.0
Urban places of over 10,000 outside urbanized areas	42,556	16.80	3	21.4
Urban places of less than 10,000 outside urbanized areas	20,612	4.80	3	3.4
Rural places of 1,000 to 2,500	18,812	8.30	11	7.6
Other rural places	-21,141	-1.60		

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#### 4. Socio-economic Patterns and Trends

This section describes statewide trends and socio-economic factors, including property values, transportation, employment location and household income. It also presents information on agricultural, archaeological, historic and architectural resources and forestry and recreation trends. Material in this section is primarily adapted from the Wisconsin Strategic Growth Task Force's 1995 report *Land Use Issues Facing Wisconsin* and information provided by several state agencies.

**Property Values.** Tables 2.4 and 2.5 (pages 34-35) show the total statewide value by property class from 1988 to 1992 -- the most recent figures available. While the total value of all classes increased 26 percent during this time, the value of the agricultural class increased only 4.9 percent. Agricultural property was 10.4 percent of the total value in 1988, and 8.7 percent of the total in 1992. Total Wisconsin property value has been increasing since 1986. The percentage change in property values has also increased every year except 1992 since then.

Between 1985 and 1993, property in Wisconsin gained almost \$45.6 billion in value (Table 2.4, page 34). Of this increase, about 81.7 percent occurred in metropolitan counties, about 10.3 percent occurred in recreational counties, and the remaining eight percent was in other non-metropolitan counties. Metropolitan counties captured 75.2 percent of the total residential value increase, while recreational counties received 12.6 percent, and the remaining non-metropolitan counties received 12.2 percent. Metropolitan counties captured 83.7 percent of the commercial value growth, with recreational counties getting five percent, and all other counties 11.3 percent. But metropolitan counties had only 66 percent of the industrial value increases, with 25 percent going to non-metropolitan, non-recreational counties and nine percent to recreational counties.

Total farmland value decreased about \$5 billion in all three groups of counties from 1985 to 1993. Since the value per acre has generally been increasing, this decrease reflects a loss of acreage. About 34 percent of the drop was in metropolitan counties and about thirteen percent in recreational counties. The bulk, 53 percent, was in the remaining non-metropolitan counties.

In rates of change, metropolitan counties saw a 59 percent increase in residential and aggregate commercial value, a nineteen percent increase in industrial value, and a 25 percent decrease in aggregate agricultural value (see Table 2.6, page 35). Recreational counties saw a 41 percent increase in residential value, a 29 percent increase in commercial value, a 63 percent increase in industrial value, and a 22.5 percent decrease in agricultural value. Other non-metropolitan counties experienced a 34 percent increase in residential value, a 37 percent increase in commercial value, a sixteen percent increase in industrial value, and a 28 percent decrease in agricultural value.

Johnson (1989) surveyed 33 Wisconsin Counties to determine patterns of resident and

nonresident ownership. He found that 4.9 percent of residential property was owned by nonresidents and 3.9 percent of agricultural property was owned by nonresidents. Commercial and industrial properties were not surveyed. The highest rate (48 percent) of nonresident ownership of residential property (based on percent of equalized value) occurred in Burnett County. This rate was followed by Sawyer (36.5 percent), Walworth (35.6 percent), Door (27.4 percent) and Bayfield (25.9 percent) counties (Johnson 1989). The highest rate (23.4 percent) of nonresident ownership of agricultural property occurred in Oneida County. This rate was followed by Kenosha (19.1) and Walworth (13.8) counties (Johnson 1989).

**Table 2.4. Wisconsin Total Value by Property Class in Millions of Dollars, 1988-1992 (Based on Wisconsin Department of Revenue Figures)**

<b>R.E. Class</b>	<b>1988</b>	<b>1989</b>	<b>1990</b>	<b>1991</b>	<b>1992</b>
Residential	77,444	81,923	87,521	94,279	101,021
Commercial	23,218	24,695	26,416	28,012	29,147
Manufact.	5,021	5,233	5,488	5,797	6,073
Agricultural	12,508	12,423	12,502	12,850	13,125
Swamp/Waste	142	144	154	165	170
Forest	2,062	2,053	2,057	2,103	2,156
<b>R.E. Totals</b>	<b>120,396</b>	<b>126,471</b>	<b>134,138</b>	<b>143,206</b>	<b>151,693</b>

**Table 2.5. Percent Change in Total Property Value by Property Class, 1988-1992 (Based on Wisconsin Department of Revenue Figures)**

<b>R.E. Class</b>	<b>1988-1989</b>	<b>1989-1990</b>	<b>1990-1991</b>	<b>1991-1992</b>	<b>1988-1992</b>
Residential	5.78	6.83	7.72	7.15	30.44
Commercial	6.36	6.97	6.04	4.05	25.53
Manufacturing	4.22	4.88	5.63	4.77	20.97
Agricultural	-0.68	0.63	2.79	2.14	4.93
Swamp/Waste	1.39	7.05	6.74	3.32	19.71
Forest	-0.42	0.19	2.20	2.54	4.56
<b>R.E. Totals</b>	<b>5.05</b>	<b>6.06</b>	<b>6.76</b>	<b>5.93</b>	<b>25.99</b>

**Table 2.6. Changes in Property Values, 1985-1993 (Based on Wisconsin Department of Revenue Figures)**

	<b>Metropolitan Counties</b>	<b>Recreational, Non-metropolitan Counties</b>	<b>Non-recreational, Non-metropolitan Counties</b>
Absolute Increase in Residential Value	\$29.3 billion	\$4.9 billion	\$4.75 billion
Percentage Increase in Residential Value	58.7 %	40.9 %	34.4 %
Absolute Increase in Commercial Value	\$9.12 billion	\$5.45 billion	\$1.23 billion
Percentage Increase in Commercial Value	59.4 %	29 %	37.2 %
Absolute Increase in Industrial Value	\$633.14 Million	\$89.72 million	\$234.24 million
Percentage Increase in Industrial Value	18.5 %	63.2 %	16.4 %

**Transportation.** The automobile is the primary means of transportation in Wisconsin. Truck transport is a major vehicle for raw materials and finished products. This heavy emphasis on highway transportation has placed a high premium on Wisconsin's road infrastructure. The interstate and state highway system has helped make it commonplace to commute from country homes to city jobs. A property's industrial or commercial value often hinges on its road access.

A variety of demographic factors influence *vehicle miles of travel* (VMT). These factors include changes in the population size and behavior and physical changes in the distribution of employment and housing. The combination of these trends has generally resulted in VMT growth rates that substantially exceed population growth rates. During the 1980s, VMT in Wisconsin increased by more than one-third, totaling approximately 44 billion miles in 1990 (Wis. Dept. Transportation 1993). Eighty-five percent of the commuters in southeastern Wisconsin drive to work alone; average vehicle occupancy for all trips in the same region declined from 1.42 in 1972 to 1.26 in 1991 (SEWRPC 1994).

Increasing vehicle miles places pressure on transportation systems. Census data show that from 1980 to 1990, there was a growing shift in the percentage of work trips made driving alone from 63 to 75 percent among twelve central cities for which data was available. At the same time, the percentage of people walking, bicycling, car pooling, or using public transit to get to work declined in these places (Wis. Strategic Growth Task Force 1995). The average percentage of workers car pooling in the twelve cities declined from 5.4 percent to 3.2 percent.

Bypasses are an example of how transportation facilities can impact land uses and vice versa. A number of large and small communities across Wisconsin are building, planning or considering a bypass because they want to divert increasing congestion away from their downtowns.

**Employment Location.** Decentralization of employment sites out of major urban areas is a significant trend in Wisconsin. As employment sites move out from urban centers, the range of residential sites within commuting distance also expands outward. A recent study by the Wisconsin Policy Research Institute based on Department of Industry, Labor and Human Relations unemployment insurance files noted that between 1991 and 1994, 276 businesses moved from Milwaukee to the suburbs and 18 moved from Madison to its suburbs. Elsewhere in the state, only 21 firms moved from central city to suburban locations during this period. Not all job decentralization, however, fits into the narrow central city-to-suburb model. A significant amount of industry relocates to rural areas.

An earlier study of the same database showed that 5,661 firms with 86,000 jobs relocated within Wisconsin between 1978-1986. Of the relocations, 65 percent were moves within the same county. Almost 2,000 firms and over 31,000 jobs moved between counties, and, of these, three-quarters moved to adjacent counties (e.g., Waukesha County gained 65 percent of the establishments leaving Milwaukee County and led the state with the largest net gain of establishments and employment from inter-county business migration). Altogether, 91 percent of

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the firms that relocated moved distances that had impacts for employees both in added travel time and in moving to different homes.

Nationally, cross-tabulating residence data with workplace data by size of place shows that there is little cross-commuting between metropolitan and non-metropolitan areas. Net commuting rates into urban places of 10,000 or more outside metropolitan areas were nearly as great (37.7 percent) as into metropolitan central cities (41.4 percent) (Wis. Strategic Growth Task Force 1995). Also, though net commuting into places of 2,500 to 10,000 in population was only 21 percent, this was because of a very high 41 percent out-commuting rate. The gross rate of the number per 100 residents commuting in was uniform at 61 to 62 percent for metropolitan central cities; urban places of over 10,000; and urban places of 2,500-10,000. This suggests that the effect of decentralized employment on residential patterns is not limited to central cities in metropolitan counties (Fuguitt 1991). This is consistent with state data showing that residents of urban areas of all sizes move to exurban areas (Wis. State Planning Office 1974).

Some decentralization of employment occurs within the same municipality. Many cities annex to help retain commercial and industrial tax base as employment centers move farther out. This may explain the relatively few plant moves from central cities to outside Madison and Milwaukee as reported by the Wisconsin Policy Research Institute from 1991 to 1994. Industries may have left the central city for peripheral areas, but were later annexed. Therefore, statistics may not do a sufficient job of presenting these trends. In support of this, the census of retail data from 1977 to 1992 shows a 64 percent increase in retail sales for both central cities in metropolitan counties and the counties themselves (Wis. Strategic Growth Task Force 1995).

Employment levels are a strong indicator of the economic health and growth potential of a city, county, or region. Based on the number of new jobs covered by unemployment compensation (the Department of Industry, Labor and Human Relations' best available indicator of potential job growth), suburban counties and counties with growing cities rank high in potential employment gains (Wis. Strategic Growth Task Force 1995). Large percentage jumps occurred in rural counties, hinting at potential growth pressures outside metropolitan areas. This is consistent with property value data (discussed above) which show that the greatest percentage increase in manufacturing value in recreational counties.

**Household Income.** Statewide, median household income increased 68.3 percent, or \$10,498, between 1979 and 1989. Assuming annual five percent inflation, state incomes increased faster than inflation (Wis. Strategic Growth Task Force 1995). Suburban counties and counties with growing cities ranked near the top in annual income growth. Counties with larger, aging industrial centers saw income growth below the state average, reflecting the growing stratification between aging urban areas and suburban areas. Many rural and northern counties had dramatic percentage gains in median annual household income, outperforming some of the high growth counties in the state. Menominee County, with an increase of only \$700 over the past 10 years, continues to be one of the state's poorest counties. Overall, counties with a large

median annual income increase are commonly found near the top in education level, population increase and job expansion.

Poverty rates are based on income for a specific family size, age of the head of the household and the number of related children under the age eighteen in the household. Poverty status is determined for families rather than individuals; all family members are classified as being below poverty level if the family's total income is below the threshold for the family size. The poverty rate in nearly all counties is less than 16.5 percent. In Bayfield, Dunn, Forest and Sawyer counties it is between 16.5 percent and 24.9 percent (Stewart, *et al.* 1996).

**Agricultural Trends.** Agricultural land is being converted to other uses at an increasing rate. A combination of local, national and worldwide trends make it increasingly difficult for Wisconsin farmers to make a living. This prompts both a reduction in the number of family farms and the amount of farmland acreage in the state.

Wisconsin and other states in the Great Lakes region have been experiencing a significant loss of farmland. Between 1982 and 1992, Wisconsin lost an estimated 1.77 million acres, or 10.3 percent of its farmland. Farmland losses in other states range from a low of 4.1 percent in Indiana to a high of 13.4 percent in Pennsylvania. The United States as a whole lost about 41.2 million acres or about 4.2 percent during the same period.

Wisconsin farmland acreage decreased from approximately 23.2 million acres in 1950 to an estimated sixteen million acres in 1990. Population in Wisconsin has increased steadily during this period (population is discussed in greater detail in the next section). In 1993, 27.9 percent of all farmland sold without buildings and improvements was being diverted from agricultural use (Wis. Dept. Agr. Trade & Consum. Protec. 1994). Between 1978 and 1994, a little over 82,000 acres of Wisconsin farmland were rezoned out of exclusive agricultural use; 45.3 percent of these acres were rezoned for residential use (Wis. Dept. Agr. Trade & Consum. Protec., 1995).

Wisconsin has an aging agricultural population with fewer young people entering farming than in past decades. The number of farms in the state decreased from 92,000 to 79,000 between 1981 and 1992 (Wis. Dept. Agr. Trade & Consum. Protec. 1994). Economic conditions sometimes force modern farmers to choose between getting the most from their land financially or continuing agricultural production. This is especially true in urban fringe areas; the development potential often causes agricultural investment (land, taxes, equipment, seed costs) to exceed the return (cash crop income, government payments).

In examining agricultural land transactions from 1973 to 1992, this conversion to other uses is evident. From 10% to 32% of the sales of agricultural land were diverted annually to other uses during this time period; this percentage has been steadily increasing since a low in 1982. These conversions reflect losses of 51,000 to 82,000 acres each year (Wis. Dept. Agr. Trade & Consum. Protec. 1994).



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Between 1983 and 1991, Wisconsin lost about a quarter of the 44,000 dairy farms in existence in 1983. In part, this reflects a steep drop-off in the rate of entry of new farmers. In the past, the decline in number of dairy farms was offset by increasing milk productivity per cow, resulting in rising milk output. Nevertheless, in the 1990s Wisconsin has experienced a serious decline in milk production for the first time.

**Forestry Trends.** Forestry is the second largest industrial sector in Wisconsin; involving more than 1,500 companies and more than 84,000 employees, it surpasses agriculture and recreation (Amer. Forest & Paper Assoc. 1995; DNR 1989). When secondary industries are considered, the Wisconsin Department of Development estimates that more than 305,000 persons are employed by the forest products industry (Wis. Dept. of Dvlpt., pers. comm.). Primary and secondary forest industries are the largest employers in 28 counties, second largest in nine counties and third largest in five counties (DNR 1989). Timber earnings account for 10-19 percent of total earnings in twelve counties, and 20-29 percent of total earnings in six additional counties (Stewart, *et al.* 1996). Forestry accounts for 4.4 percent of earnings in the state (as compared to 1.4 percent in the entire U.S.) (Amer. Forest & Paper Assoc. 1995).

Wisconsin's commercial timber resources comprise some 15.7 million acres, 98 percent of Wisconsin's forest lands (Schmidt 1997). Table 2.7 (page 40) depicts timberland ownership. Nonindustrial, private parties own 62 percent of the total commercial forest land in the state (Smith 1986). Wisconsin ranks second only to Minnesota in total acres of commercial forest in county and municipal ownership (Smith 1986).

Of all timber harvested in the U.S., fifty percent comes from nonindustrial, private lands (Amer. Forest & Paper Assoc. 1995). Tree farms represent a significant portion of these lands. Wisconsin has nearly 4,000 tree farms on about 1,700,000 acres (Amer. Forest & Paper Assoc. 1995).

In terms of volume of wood used, pulp mills dominate Wisconsin's forest industry, but sawmills far outnumber any other category (Hackett and Whipple 1995). There were 311 mills of all types operating in the state in 1992 (see Table 2.8, page 40).

**Table 2.7. Ownership of Commercial Timber Resources (Data from Wisconsin DNR Bureau of Forestry and Smith [1986])**

Ownership Category	Million Acres	Percent
Nonindustrial Private	9.72	62
Forest Industry	1.10	7
Federal	1.52	10
State	0.74	5
County	2.28	15
Native American	0.34	2
<b>Total</b>	15.70	100

**Table 2.8. Number of Active Primary Wood-using Mills in Wisconsin in 1992 (Data from Hackett and Whipple 1995)**

Type of Mill	Number
Large Sawmills	33
Medium Sawmills	106
Small Sawmills	114
Pulp Mills	21
Veneer Mills	12
Other Mills	25
<b>Total</b>	311

**Notes:** "large sawmills" are mills with an annual lumber production in excess of 5 million board feet., "medium sawmills" are mills with an annual production from 1 to 5 million board feet, and "small sawmills" are mills with an annual production from 50 thousand to 1 million board feet. "Pulp mills" includes particle board plants.

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Total timber harvested for industrial *roundwood* was 499 million cubic feet in 1992 (Hackett and Whipple 1995). Eighty-four percent of the total growing-stock removals due to harvest came from aspen (*Populus* spp.), red oaks (*Quercus rubra*, *Q. velutina* and *Q. ellipsoidalis*), hard maple (*Acer nigrum* and *A. saccharum*), red pine (*Pinus resinosa*), white birch (*Betula papyrifera*), jack pine (*Pinus banksiana*) and soft maples (*Acer rubrum* and *A. saccharinum*).

Softwoods (coniferous trees) and aspens accounted for 66 percent of the roundwood production used for pulpwood in 1992 (Hackett and Whipple 1995). Aspen continues to be in high demand and Wisconsin's pulpwood market remains strong, but aspen supply constraints have led to greater use of pine, birch and other hardwood species. Ninety percent of the pulpwood cut in Wisconsin remains in the state (Hackett and Whipple 1995). Bayfield, Marinette, Oneida and Vilas counties lead in pulpwood production.

Saw logs ranked second behind pulpwood in roundwood production in 1992, accounting for nearly 30 percent of the state's roundwood product output (Hackett and Whipple 1995). Loggers delivered 588 million board feet of Wisconsin saw logs to mills in Wisconsin, Michigan, Minnesota and other states in 1992. Major saw log species include red oak, aspen, hard maple, white oaks (*Quercus alba*, *Q. macrocarpa*, *Q. muehlenbergii* and *Q. bicolor*) and red pine. Aspen saw log production increased eleven percent between 1990 and 1992 (Hackett and Whipple 1995). Forest, Marinette, Oconto, Bayfield and Marathon counties lead in saw log production. In addition to saw logs cut in Wisconsin, more than 48 million board feet of saw logs from Michigan, Minnesota, Iowa and Illinois were imported in 1992 (Hackett and Whipple 1995).

Logs cut in Wisconsin for veneer accounted for 52 million board feet in 1992, 65 percent of which remained in the state (Hackett and Whipple 1995). An additional fifteen million board feet of veneer logs were imported from Michigan, Minnesota, Iowa, Illinois and Canada. Hardwoods account for 96 percent of the logs cut for veneer, and aspen is the primary species cut for this use. Major species imported include hard maple, red oak and basswood (*Tilia americana*).

An additional 8.6 million cubic feet of timber were cut in the state for other industrial products (Hackett and Whipple 1995). Industrial fuelwood accounted for more than half of this roundwood production.

For additional or more detailed information on forestry trends in Wisconsin, readers are referred to Hackett and Whipple (1995), American Forest and Paper Association (1995), DNR (1989), Smith (1986) and Schmidt (1997).

**Recreation Trends.** Recreation accounts for about \$4.1 billion dollars annually and is one of the larger industrial sectors in the state (DNR 1989). Recreation and associated industries account for significant portions of the economy in many counties. For example, recreation accounts for more than ten percent of total earnings in Bayfield, Iron and Vilas counties, 7-9 percent of total earnings in Florence County, and 4-6 percent of total earnings in six additional counties (Stewart, *et al.* 1996). Only in eastern and southern Wisconsin counties, and a few scattered central counties, does recreation account for less than one percent of total earnings.

Outdoor recreation is a very broad term. Wisconsin's geography, climate and cultural traditions have shaped choices and patterns of recreation in the state. These activities are diverse, and range from relaxing to rock climbing. Many resident urbanites, as well as non-residents vacation in Wisconsin's rural areas.

Wisconsin has a total of 55 state parks, 568 county parks, thousands of local parks and hundreds of privately-owned resorts available for outdoor activities (DNR 1991). There are more than 2,300 picnic areas in the state, with at least 880 shelters and more than 2,400 locations have playgrounds for children. National, state, and county forests also provide numerous recreational opportunities for residents and visitors. Table 2.9 (below) summarizes facilities in Wisconsin's public forests (DNR 1991).

**Table 2.9. National, State and County Forest Recreational Facilities  
(Estimates Based on Information from the Wisconsin DNR  
Bureau of Forestry)**

	National Forests	State Forests	County Forests	Total
Campsites	1,240	1,240	1,760	4,240
Nature trails (miles)	3.7	12.0	9.0	24.7
Hiking trails (miles)	452	70	511	1,033
Snowmobile trails (miles)	827	211	1,800	2,838
Hunting lands (acres)	1.4 million	0.8 million	2.4 million	4.6 million

More than 53,900 camping reservations are made in Wisconsin state parks annually generating more than \$9 million in fees. State parks annually provide direct interpretive contacts with

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177,500 visitors at 48 properties, provide environmental education programs to 38,500 school children at 44 properties, provide educational materials to 345,000 visitors at 16 visitor centers and operate 58 self-guided nature trails with an estimated 929,200 users (Kimberly Currie, Bureau of Parks and Recreation, Wisconsin DNR, pers. comm.).

Additional information on Wisconsin's recreational resources, recreational activities and trends, and the results of the 1990 Wisconsin outdoor recreation study, readers are referred to the *Wisconsin Statewide Comprehensive Outdoor Recreation Plan, 1991-1996* (DNR 1991).

**Archeological Resources.** Wisconsin once had an estimated 20,000 burial mounds. Today, 5,000 remain (Jeff Dean, Director, Historic Preservation, State Historical Soc. of Wis., pers. comm.). There are nearly 50 designated archaeological districts and mound groups listed in the State Register of Historic Places (Reed 1994). In "A Survey of the Destruction of Effigy Mounds in Wisconsin and Iowa," Peterson (1984) reported the results of a study of six representative Wisconsin counties -- Crawford, Dane, Grant, Sauk, Walworth and Washington. He concluded that 82 percent of the effigy mounds identified historically by archaeologists in these counties had been destroyed.

**Historical and Architectural Resources.** Wisconsin has more than 150 historic districts located in communities throughout the state (Reed 1994). These areas, listed in the National Register of Historic Places and the State Register of Historic Places, may include hundreds of buildings, only a few structures, or carefully designed landscapes. Additional information on Wisconsin's historic districts can be found in *A Guide to Historic Districts in Wisconsin* (Reed 1994).

During the 1930s and 1940s, out-of-work architects and historians were employed throughout the United States by the National Park Service to identify and document historic buildings. The result was the *Historic American Buildings Survey* (HABS) housed in the U.S. Library of Congress. This was the only known early survey of historic buildings in the state. The buildings documented by HABS were outstanding structures of national or statewide significance. Of 88 historic buildings identified in Wisconsin, State Historical Society of Wisconsin records show that 63 of these buildings remain standing. Historic buildings of local significance likely were lost at a greater rate.

Through Wisconsin's system of Rustic Roads, many corridors of scenic beauty and cultural and historical importance have been preserved throughout the state. Sixty-seven stretches of roadway, generally at least two miles long, have been designated as Rustic Roads in 43 counties (Wisconsin DOT 1994).

## **5. Land Use Patterns and Trends**

This section briefly describes some of the land use implications related to the state-level

population and socio-economic trends presented in the previous four sections. Because the issues surrounding land use choices and trends are often highly localized, this section offers a general overview of influences on land development. Information used for this section came primarily from *Land Use Issues Facing Wisconsin*, a 1995 report of the Wisconsin Strategic Growth Task Force.

Land use decisions are a function of existing or anticipated demographic, economic, agricultural, social, cultural and natural conditions. These indicators all affect and are affected by land use planning and planning-related decisions. Having given an overview of these factors in the preceding sections, some assumptions regarding development in the state may be made.

As discussed in the "Human Population and Demographics" section, Wisconsin is one of the fastest growing states in the Midwest. Nearly every county has a growing or stable population. Furthermore, trends in smaller household sizes have led to a rate of growth in housing development that exceeds the population growth rate. The general implications for this are an increased rate of land conversion to residential (and ancillary uses) from less intensive uses, such as agriculture. The trend of land conversion on the periphery of urbanized areas is further substantiated by the population shifts from urban to urban fringe areas.

In the section on "Socio-economic Patterns and Trends," indicators such as property value, transportation, employment location and household income also showed trends that supported continued pressure for land conversion. Property values for all land classes have been rising; this has shown increased rates of loss of rural and agricultural land. State transportation figures have shown an increase in vehicle miles traveled. This was attributed to several things, including a general increase in population, less carpooling and greater commuting distances to work. Land uses associated with these changes tend to have lower densities and therefore less efficient uses of resources, further increasing the reliance on automobile transit. Changes in employment location also suggest continued pressure for large scale, auto-oriented development. Finally, patterns of population growth continue to be in those places already burdened by high growth rates. These existing urban areas have higher median household incomes and greater job growth, making relocation there attractive.

Trends in industries such as agriculture, forestry and recreation may also be forcing shifts in land use patterns, particularly in rural areas. Shifts in the market, technology, taxation and demographics are changing the structure of the agricultural industry. As more and more farmers leave agriculture, land is frequently being diverted to other uses. In addition, extremely rural areas heavily dependent on industries such as forestry or recreation may see more manufacturing development as some communities seek to diversify their economies.